

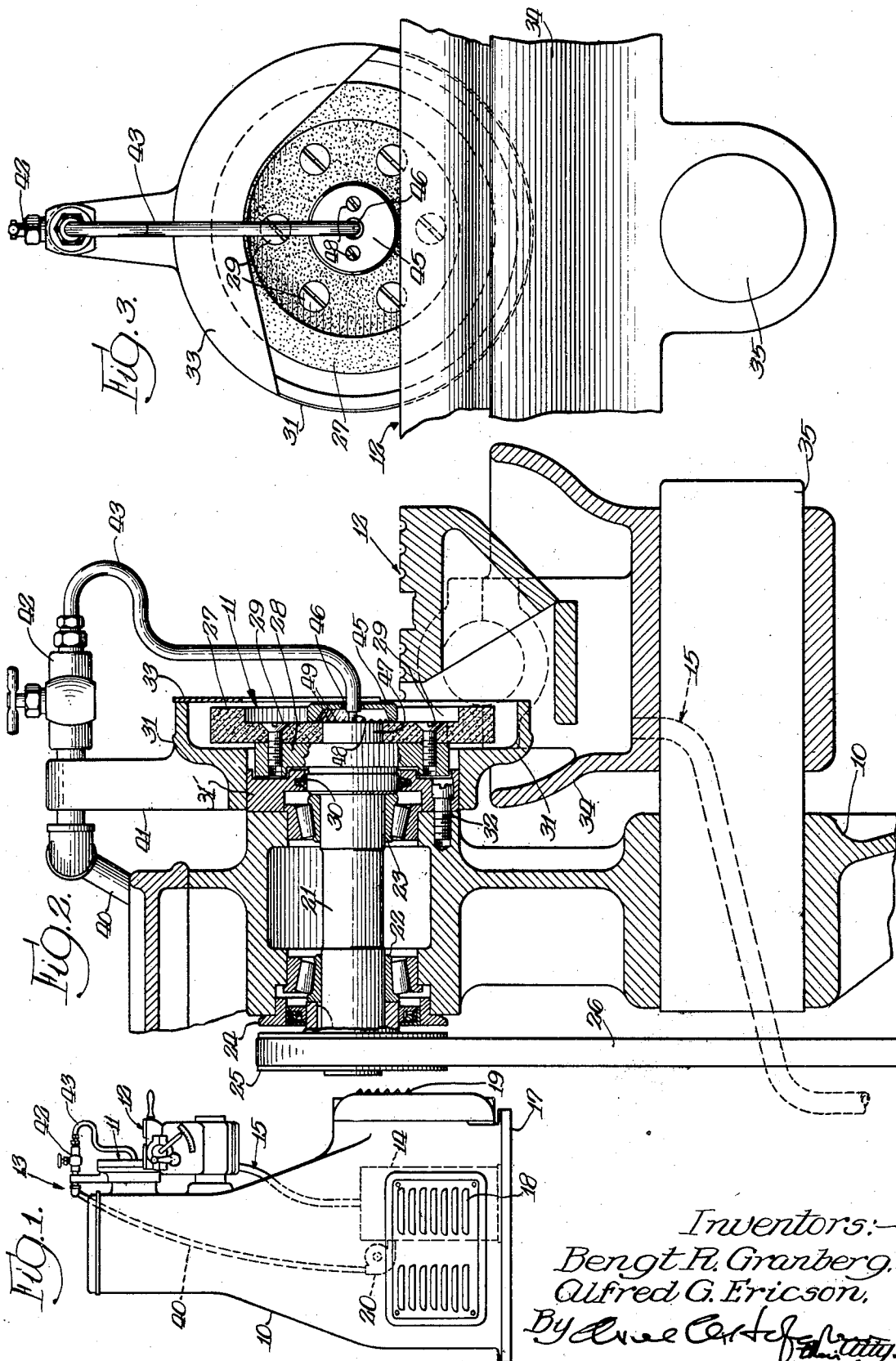
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B. R. GRANBERG ET AL

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COOLING DEVICE FOR MACHINE TOOLS

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COOLING DEVICE FOR MACHINE TOOLS

Bengt E. Granberg and Alfred G. Ericson, Rockford, Ill., assignors to Sundstrand Machine Tool Co., Rockford, Ill., a corporation of Illinois

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This invention relates to machine tools and particularly to grinding machines.

One object of our invention is the provision of a new and improved device for applying a coolant to a machine tool.

Another object is the provision of a new and improved system for distributing the coolant centrally and evenly over a grinding wheel.

Still another object is a new and improved system for cooling a grinding wheel which is dependent on the action of centrifugal force to distribute the coolant from the center outward over the surface of the wheel.

A further object is a new and improved system for cooling a grinding wheel which mechanically circulates the liquid coolant between a tank and the wheel where the coolant is collected in a large confined space from which it flows smoothly to the wheel and which is dependent upon the action of centrifugal force to distribute the coolant from the center of the wheel outward over the surface thereof and from the surface to a collecting means preparatory to returning the coolant to the tank for recirculation.

Other objects and advantages of our invention will appear as the description proceeds taken in connection with the drawing which forms a part of this application.

Fig. 1 is a side elevation of a grinding machine on a reduced scale;

Fig. 2 is a fragmentary sectional view of the machine showing the invention; and

Fig. 3 is a front elevation of a part of the machine shown in Fig. 2.

While we have shown in the drawing and will herein describe in detail the preferred embodiment of our invention, it is to be understood that we do not thereby intend to limit the invention to the specific form disclosed, but aim to cover all modifications and alternative constructions falling within the spirit and scope of the invention as expressed in the appended claims.

In the operation of grinding machines and particularly grinding machines provided with a disc faced with abrasive material against which work pieces may be ground, there is always presented the problem of cooling the grinding wheel which becomes heated due to friction produced by contact between the wheel and a work piece. Cooling is frequently accomplished by distributing a liquid coolant over the face of the wheel by some convenient means, the coolant being usually an appropriate water solution. The herein described invention is devoted to a novel means of applying the coolant so that the entire

grinding wheel is thoroughly and evenly cooled at all times during the grinding operation. The cooling is effected by applying the liquid coolant evenly to the center of the grinding wheel from which it is carried outward over the face by the action of centrifugal force.

To illustrate the invention, a typical grinding machine has been selected comprising a frame 10 upon which is mounted a power driven grinding device generally indicated 11, and provided with a work support 12. The coolant is carried from a tank 14 to the grinding device by a supply conduit means 13 and returned to the tank by a return conduit means 15.

The frame 10 rests upon a base 17 and houses a suitable power mechanism within the lower portion, ventilated by means of the louvers 18 and 19. Also located within the frame is the tank 14 containing a liquid coolant which is withdrawn therefrom by a pump 20 and forced upward through the supply conduit means 13 to the grinding device 11.

The grinding device 11 is mounted on the upper portion of the frame 10 and consists of a shaft 21 journaled in the frame by means of bearings 22 and 23. The bearings and shaft are well lubricated with a suitable lubricant which is confined to the area surrounding the contacting surfaces in part by a packing 24. At one end of the shaft 21 is a drive pulley 25 driven by a belt 26 from the power mechanism and at the other end is a fixture designed to support a grinding wheel. In the embodiment here presented, the grinding wheel consists of a recessed or cup shaped disc 27 secured to a flange 28 of the shaft 21 by means of screws 29, the end of the shaft supporting the flange 28 being also made tight against the leakage of lubricant by insertion of an annular packing ring 30. Another function of the packing ring 30 is to prevent liquid coolant carrying abrasive particles from coming into contact with the bearings.

Surrounding the grinding wheel 27 is a guard flange 31 secured to the frame 10 by means of an inner member 31' and screws 32 and provided with a depending skirt portion 33 adjacent the outside of the grinding wheel to prevent accidental contact therewith. The flange 31 extends around the wheel and at the under side lies below the rim of a receptacle or tray 34 forming a part of the means 15 for returning the spent coolant to the supply tank 14. Connected to the receptacle or tray 34 is the work support 12 and both oscillate together in a conventional manner about a shaft 35.

Cooling of the grinding wheel is accomplished by supplying a continuous flow of a liquid coolant which, after it has been used for cooling purposes, is returned to the supply tank and made ready for recirculation.

In addition to the supply tank 14 and pump 20, the supply conduit means 13 contains a pipe 40 which leads upward from the pump 20 to the top of the frame where it is supported by an extension 41 secured by the flange 31 to the frame. Adjacent the extension there is a shut off valve 42 in the liquid line by means of which the quantity of coolant supplied can be controlled.

After the coolant leaves the valve, it passes downward through a pipe 43 to a point adjacent the face of the grinding wheel 27. In order that the coolant may be distributed perfectly and evenly, it is introduced to the grinding wheel directly at the center at the bottom of the recessed portion, there being provided a passage for the liquid between the bottom of the wheel and the edges of a cup like container 45, at the end of the pipe 43.

The container 45 is here shown several times larger in diameter than the pipe 43 and firmly secured to a knob 47 on the flange 28 by means of screws 48 so that the container rotates with the wheel. A hole 46 appreciably larger than the outside diameter of the pipe 43 permits the pipe to be inserted within the container without interfering with the freedom of rotation. When mounted in the manner shown, the cup like container 45 becomes filled with coolant supplied to it from the pipe 43, which flows immediately to the outer edge of the container where it escapes, in the embodiment shown, through notches 49 in the edge and thereupon is distributed evenly over the center of the recessed portion of the wheel 27. When introduced in the manner described, the coolant, once deposited upon the face of the grinding wheel, is carried evenly and simultaneously in all directions by centrifugal force, first over the bottom of the recessed portion and then outward over the grinding face until it reaches the periphery thereof from which it is flung into the surrounding space.

By reason of the grinding wheel being surrounded by a flange 31, all of the coolant which is flung from the wheel is intercepted thereby and passed as spent fluid downwardly into the tray 34 from whence it is conducted by means of the return conduit 15 back to the supply tank 14.

It will thus become apparent that when the grinder is started, a liquid coolant may be supplied to it in quantities determined by the valve 42 and that when once applied to the center of the grinding wheel, the coolant will be distributed

in uniform, even quantities in all directions at the same time, so that there may be absolutely uniform cooling of the face of the grinding wheel. Such a cooling is very beneficial in view of the fact that any expansion or contraction due to heating or cooling will be uniform throughout the abrasive portion of the wheel serving thereby to minimize deterioration and cracking.

We claim as our invention:

1. In a grinding machine having a rotatable spindle and a grinding wheel mounted on one end of the spindle for rotation therewith, a coolant supply means for the grinding wheel comprising a cup-shaped coolant distributing member secured over the end of said spindle concentrically of the grinding wheel with its open face toward the wheel and its periphery bearing against the radial face of the wheel in order that coolant may be applied to the wheel at its center, said member having its peripheral edge serrated to provide a multitude of small openings through which coolant may flow along the radial face of the grinding wheel from the inside of the cup-shaped member radially outwardly over the face of the grinding wheel under the influence of centrifugal force, and a conduit projecting through the closed face of the cup-shaped member concentrically thereof to supply coolant centrally of the chamber formed by the cup-shaped member and the grinding wheel.

2. In a grinding machine having a rotatable spindle and a grinding wheel mounted on one end of the spindle for rotation therewith, a coolant supply means for the grinding wheel comprising a cup-shaped coolant distributing member secured over the end of said spindle concentrically of the grinding wheel with its open face toward the wheel and its periphery bearing against the radial face of the wheel in order that coolant may be applied to the wheel at its center, said member having its peripheral edge serrated to provide a multitude of small openings through which coolant may flow along the radial face of the grinding wheel from the inside of the cup-shaped member radially outwardly over the face of the grinding wheel under the influence of centrifugal force, and having an opening centrally of the base thereof, and a conduit extending through the opening in said cup-shaped member for supplying coolant to the chamber formed by said member and the grinding wheel, said conduit being smaller in diameter than the opening in said cup-shaped member permitting free escape of the coolant to assure the supply of coolant at atmospheric pressure.

BENGT R. GRANBERG.
ALFRED G. ERICSON.